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From: Katinka Ridderbos <T.M.Ridderbos@fys.ruu.nl>
To: Professor Michael Redhead <mlr1000@cam.ac.uk>
Subject: Re: Ridderbos and Redhead. REPORT 2AR
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Dear Michael,

thank you for your fax. Here is a draft of a reply to Prof. Van der Merwe; I have simply written down all the points of your fax, since I agree with all of them! (I'll correct the typos in the paper.) When Professor Van der Merwe approves of these amendments, I will incorporate them into the paper itself.

with best wishes,
katinka

Dear Professor Van der Merwe,

thank you for sending us the Report 2AR concerning our paper "The spin-echo experiments and the Second Law of Thermodynamics". In order to meet the points raised in this new reply of the second referee, we suggest making the following adjustments to the paper.

Point No. 1: We propose re-writing paragraph 1 of p.16 as follows:
"We disagree with Sklar: the first stages of ~~teh~~ spin-echo experiments do **not** show the behaviour we normally take ourselves to be explaining; it is true equilibrium, not apparent equilibrium which is typical of thermodynamic behaviour. This is illustrated by the case of an imaginary coarse-grainer. Such a person will predict the wrong results. Suppose she just walks by and happens to see the system at the moment the free induction signal has died out and the second rf pulse has been applied. She will then predict that the system will remain in the apparently disordered state; but in fact, of course, the system will return to a state with all the spin axes aligned along the same axis, so that the echo signal is emitted. The echo will come as a complete surprise to the coarse-grainer. For the interventionist the echo is no surprise at all, since he knows that the system has been prepared in a very special way (that minimises the effect of interventionist perturbations). The kind of thermodynamic behaviour we would like to explain using statistical mechanics is the behaviour which leads to the usual situation in which an innocent observer unaware of the history of the system will actually make the right prediction, namely that the system is going to stay in the equilibrium state for all future times. It is these states which can truly be called equilibrium states."

Point No. 2: We propose adding the following comment at the end of paragraph 1 on p.10:

"We do not claim, of course, that it is a virtue of our model that it is a mixing system and has no stronger ergodic properties. On the contrary our remarks about the infinite time ~~the~~ system needs to reach the equilibrium state points to the problematic aspects of approaches based on mixing properties, since we are convinced that statistical mechanics should reproduce the finite relaxation times we find in real thermodynamic systems. The interventionist approach we defend later in this paper makes no reference to ergodic theorems, and may be expected to produce more

realistic relaxation times to true equilibrium even for mixing systems.
(In general we reject ergodic approaches since they do not appear to be relevant for realistic systems.)"

Point No. 3: paragraph 2, p. 17: we propose simply omitting the last sentence, which the referee feels might be a source of confusion.

Point No. 4 (final paragraph of referee's reply): we suggest the following new paragraph to be inserted just before the last paragraph of p.19:

"Effectively the system is 'exporting' its correlations to the environment, but, of course, the argument can be repeated for the larger system consisting of the original system under investigation and its immediate environment, which will also exhibit an increase in fine-grained entropy, due to perturbations from the 'environment of the environment'.

But, finally the question arises what the implications of the interventionist approach are for the universe as a whole"

We trust the amendments meet with your approval.

Regards,

Prof. M.L.G. Redhead and Ms T.M. Ridderbos

*Dear Michael,
Thanks for the report. There are a few typos
in the report, but 3 or 4 in Part 2, and line 2 of para
Point 4. John's seems correct - in the 3rd
it off to Van der M
Best - Michael*